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WITNESS my hand this
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2004906824

Regulation 3.2

A U S T R A L I A
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PROVISIONAL SPECIFICATION
for the invention entitled:

"Fence construction systems"

The invention is described in the following statement:

Proprietary or Confidential - (10th 12504702 serial prov 333.000-30/11/04)

- 1 -

FENCE CONSTRUCTION SYSTEMS

BACKGROUND TO THE INVENTION

5. This invention relates to construction of fences, in particular but not only to systems for construction of pool fences or balustrades. The systems might also be suitable for other structures having particular features in common with fences such as ladders.

Pool fences are constructed in a wide variety of ways. A standard pool fence typically has
10 a number of aluminium panels or frames that are formed separately then placed in position together. Each panel has two or more horizontal rails that support a series of vertical pickets. The panels are assembled by passing the pickets through apertures in the rails. Each picket is then welded or crimped externally to the rails and the assembled structure is painted. The rails and pickets come in many forms and may be assembled in a wide variety
15 of structures.

SUMMARY OF THE INVENTION

It is an object of the invention to provide for improved construction of pool fences, or at
20 least to provide an alternative to existing systems.

In aspect the invention resides in a fence having at least one hollow rail and a plurality of pickets supported by the rail, wherein the pickets enter the rail by passage through respective entry apertures in the rail, and are fastened to the rail by fastening means located
25 inside the rail.

In one embodiment, each picket includes a fastening aperture located within the rail and the fastening means includes a rod that passes through the fastening apertures and thereby prevents further passage of the pickets through their respective entry apertures. Preferably the fastening apertures are located adjacent an inner surface of the rail and the rod has been forced through the fastening apertures against resistance from the inside surface of the rail.
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In another embodiment, the fastening means includes a portion of each picket located inside the rail that has been deformed after entry of the picket within the rail and thereby prevents further passage of the pickets through their respective entry apertures. Preferably 5 the portion of each picket that has been deformed within the rail has a partly flattened shape that no longer matches the shape of the respective entry aperture in the rail.

In one fence, the pickets pass through the rail from one side to the other. Preferably the fence has two parallel rails that support the pickets and the pickets pass fully through at 10 least one of the rails.

In another part of the fence the pickets pass though only one side of the rail and end within the rail. Preferably the rail has an internal wall and the pickets end in respective apertures of the internal wall.

15 In a further aspect the invention resides in a fence having at least one hollow rail and a plurality of pickets supported by the rail, wherein the rail has an external wall with entry apertures for the pickets, and an internal structure for holding end portions of the pickets, and wherein each picket enters the rail through a respective entry aperture and has an end 20 portion which is held by the internal structure.

Preferably the internal structure of the rail includes a wall with holding apertures for 25 respective end portions of the pickets. Preferably the holding apertures are aligned with the entry apertures so that the pickets are perpendicular to the rail. Alternatively the holding apertures are offset from the entry apertures so that the pickets are not perpendicular to the rail.

In one embodiment the internal structure is moveable within the rail to vary the alignment 30 of the holding apertures and the entry apertures. In another embodiment the internal structure includes a plurality of flanges which receive end portions of respective pickets.

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Preferably the pickets are fastened to the rail by fastening means provided inside the rail. The fastening means may be a rod that connects the pickets within the rail. Alternatively the fastening means is a deformed portion of each picket within the rail.

- 5 In another aspect the invention resides in a method of forming a picket structure, including: providing a hollow rail to support a plurality of pickets, passing each picket at least partly through the rail, and fastening the pickets to the rail from within the rail.

In one embodiment, fastening the pickets includes threading a rod through apertures in the pickets inside the rail. Threading the rod includes deformation of the rail through interaction between the rod and an inside surface of the rail.

In another embodiment, fastening the pickets includes deforming the pickets inside the rail. Preferably deforming the pickets includes passage of a crimping device through the rail.

- 15 In another aspect the invention resides in a picket construction having a rail and a plurality of pickets supported by the rail, each picket being fastened to the rail by fastening means located within the rail.

- 20 The construction may be a fence or balustrade, or a similar structure having similar rail and picket features such as ladder.

In another aspect the invention resides in a equipment for constructing panels for a fence or picket structure as outlined above.

- 25 The invention may also be said to reside in any alternative combination of features that are indicated in this specification. All equivalents of these features are deemed to be included.

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LIST OF FIGURES

Preferred embodiments of the invention will be described with respect to the accompanying drawings, of which :

- 5 Figure 1 shows components of a panel for a pool fence,
- Figure 2 shows an assembled panel having pickets held by three rails,
- Figure 3 shows an assembled panel having pickets held by two rails,
- Figure 4 shows one way of fixing the pickets within the rails using a locking rod,
- Figure 5 shows another way of fixing the pickets within the rails by crimping,
- 10 Figure 6 shows how a top rail structure may be strengthened,
- Figure 7 shows how the structure in Figure 6 may be used in a raked panel,
- Figure 8 shows equipment that may be used to fix the pickets in the rails,
- Figure 9 shows various crimping components for the equipment in Figure 8,
- Figure 10 shows an alternative component for the equipment in Figure 8, and
- 15 Figure 11 outlines the main operational steps of the equipment.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Referring to the drawings it will be appreciated that the invention can be implemented in
20 various ways for a range of different structures, such as pool fences, balustrades and
ladders. This description of pool fence embodiments is given by way of example only.

- 25 Figure 1 shows the main components of a panel for a pool fence including a bottom rail 10,
mid rail 11, a top rail 12, a number of pickets 13, two posts 14, locking rods 15 and top
pins 16, and bottom pins 17. These components may be provided in a wide range of
numbers, shapes, and sizes, and may be assembled in different ways, depending on the
purpose and style of the fence. The components are usually provided has hollow tubes or
other sections of a metal such as aluminium.
- 30 Figure 2 shows how the panel may be assembled. The pickets 13 pass through pairs of
apertures in the bottom and mid rails 10, 11 and enter but do not exit the top rail 12, which

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has apertures on one side only. The rails are fixed in apertures in the posts 14 using the bottom and top pins 16, 17. Traditionally the pickets are fastened to the rails by external welding or crimping. In this case the pickets are fastened by internal means, such as the locking rods 15 which thread the pickets, or by internal crimping.

5

Figure 3 shows part of a panel of another fence having bottom and mid rails 30, 31 only, and again by way of example. The pickets 32 pass through apertures in each rail and are fastened to the rails.

- 10 Figures 4a and 4b show two ways of fastening a picket to a rail from within the rail, using a locking rod, such as rod 15 in Figure 1. In Figure 4a, a top rail 40 and one end of a picket 41 are shown in cross section. The picket passes through an aperture on the underside 43 of the rail. A locking rod 42 passes through an aperture in the picket, located inside the rail, and deforms the underside of the rail. The aperture in the picket partly overlaps with the aperture in the rail. Force is required to insert the rod and causes the deformation. The rod threads all of pickets in the panel.
- 15

- 20 Figure 4b shows an alternative in which the inside of the rail includes a guide 45 for the locking rod 42. The guide may be continuous within the rail. Apertures in pickets are aligned with the guide as indicated.

- 25 Figure 5 shows another way of fastening a picket within a rail to form a panel or other structure. In this example, bottom rail 50 and top rail 51 hold the picket 52. The picket has been deformed in portions 53 and 54 within each rail, by crimping for example. A circular picket is deformed into a relatively flattened cross section within the rail and this prevents removal of the picket from either rail.

- 30 Figure 6 shows an enhancement of Figure 5. In this example, top rail 60 now includes a support structure 61 which engages one end of the picket 62 to strengthen the panel once assembled. A portion of the picket has been crimped between within rail and below the support structure. Bottom rail 63 functions as before. In Figure 6b the support structure is

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indicated as a plate 65 with a series of apertures. In Figure 6c the support structure is a series of individual flanges or a continuous flange within the rail. In Figure 6d the plate in Figure 6b is held by fixtures on the in side walls of the rail. In Figure 6e, the support structure is adapted for a bottom rail or mid rail 68.

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Figure 7 shows how the enhancement may assist with a raked panel such as required in a bannister. In Figure 7a the rails 70 are not perpendicular to the pickets 71, and the pickets pass only partially through both the top and bottom rails. As shown in Figure 7b this may require the support structure of Figure 6a to be offset within the rail. The structure may be 10 slidable within the rail to assist assembly and installation of the panel on site. Figures 7c and 7d show how a slidable plate or flange may be formed within the rail. Note that the apertures in the support structure may be elongated in the case of circular pickets.

- 15 Figure 8 schematically shows equipment for crimping a series of pickets inside a set of rails to form a panel. In Figure 8a, a frame 80 is mounted on a stand 96 with two rows of brackets 81 for holding the rails. A retension device 82 on vertical strut 97 position the open ends of the rails as shown in Figure 8b. A carrier device 83 mounted on a wheel system 84 pushes and pulls crimping tools 86 into and out of the rails. Chains 87 driven by motor 88 through shaft 89 move the carrier device. Chain guide 90 is tensioned by leaf spring 91. An idler shaft 92 enables the chain to make a horizontal circle limited by carrier 83. A lower guide 93 straddles lower strut 94 and also supports the carrier. Forward, reverse and emergency stop controls are provided among other components.
- 20
- 25 Figure 9 schematically shows action of the crimping tool along in Figure 8. In Figure 9a, a tool 100 is positioned then pulled through a rail 101 containing series of pickets 102, seen from above. In this example the tool includes two parallel elongate bars, having opposed and thickened end portions 103. The end portions of the bars remain together and sequentially compress the portions of the pickets within the rail. The tool may be passed 30 through the rail before insertion of the pickets or may pass through the rail in one direction only.

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Figure 9b shows alternative crimping tools, including bars having rounded wedge portions 105, stepped wedge portions 106, and a roller assisted wedge portion 107.

- 5 Figure 10 shows a further alternative crimping tool intended for high speed processing of panels. In Figure 10a the tool includes a single bar 110 with a wedge 111 mounted on holder 112. The wedge takes an orientation narrower than the width of the bar when the tool is inserted in a rail containing pickets, and passes the pickets without crimping. The tool is then withdrawn and the wedge relocates on the holder to expand beyond the width
10 of the bar, thereby contacting and deforming the pickets within the rail. Figure 10b shows the geometry of the wedge.

Figures 11a to 11c show a panel forming and crimping operation in relation to the equipment in Figure 8. The actions described in these figures are generally self
15 explanatory.

DATED this 30th day of November, 2004
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by DAVIES COLLISON CAVE
20 Patent Attorneys for the Applicants

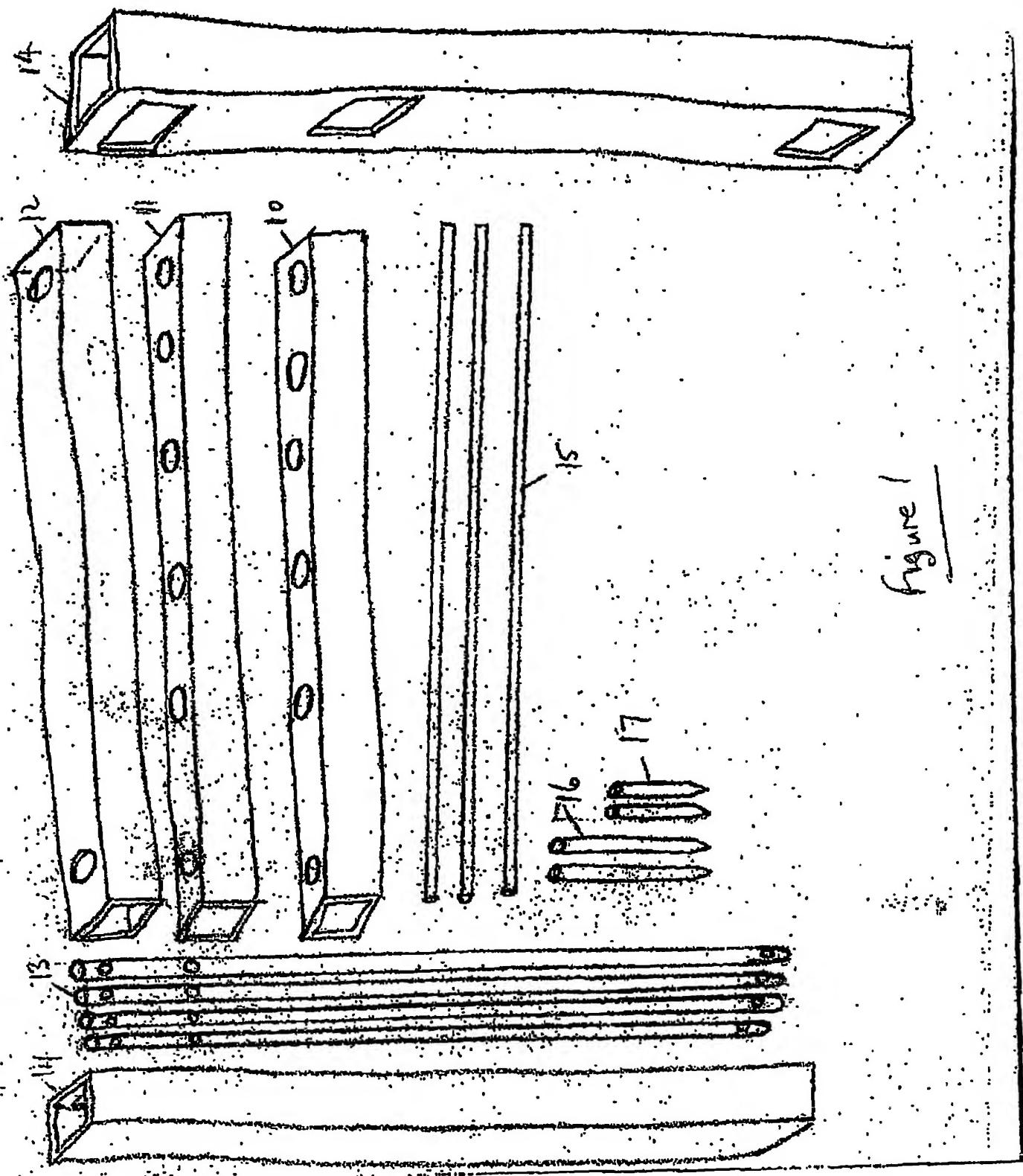
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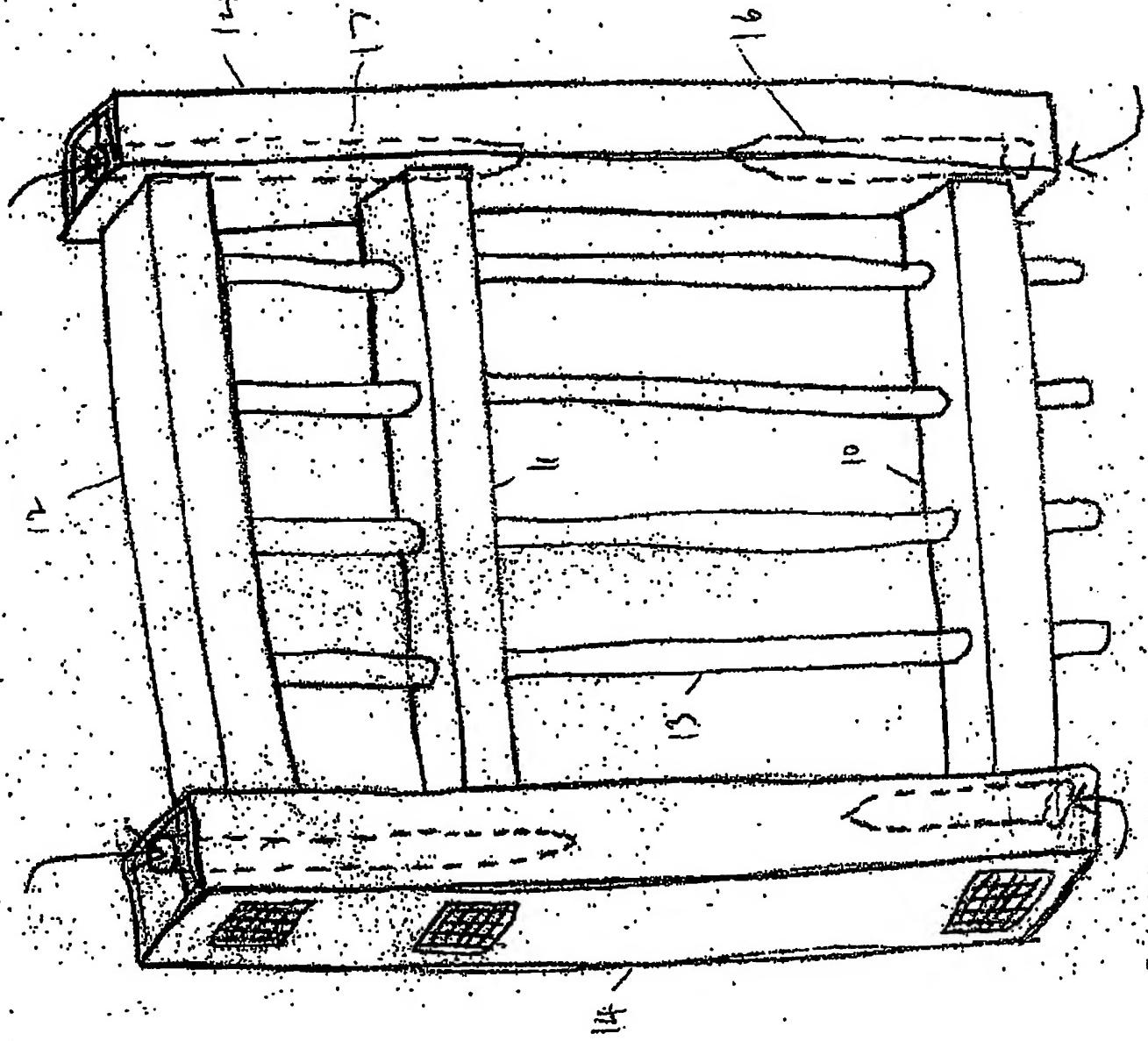
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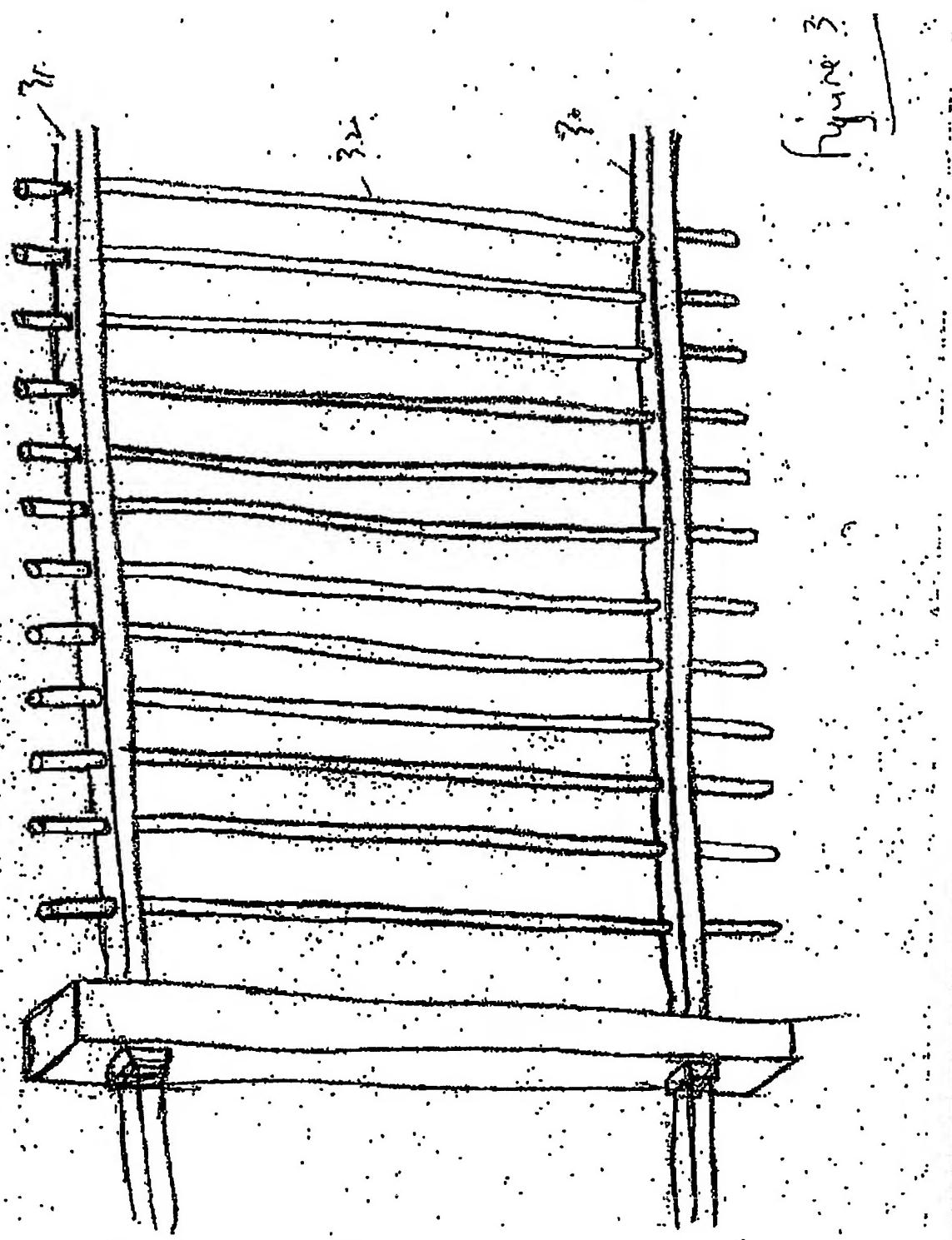
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figure 2

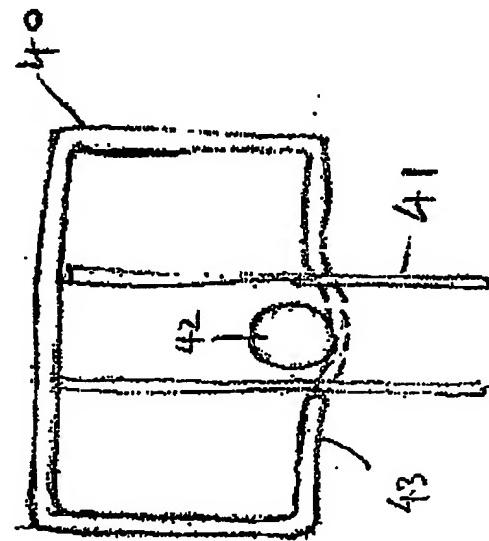


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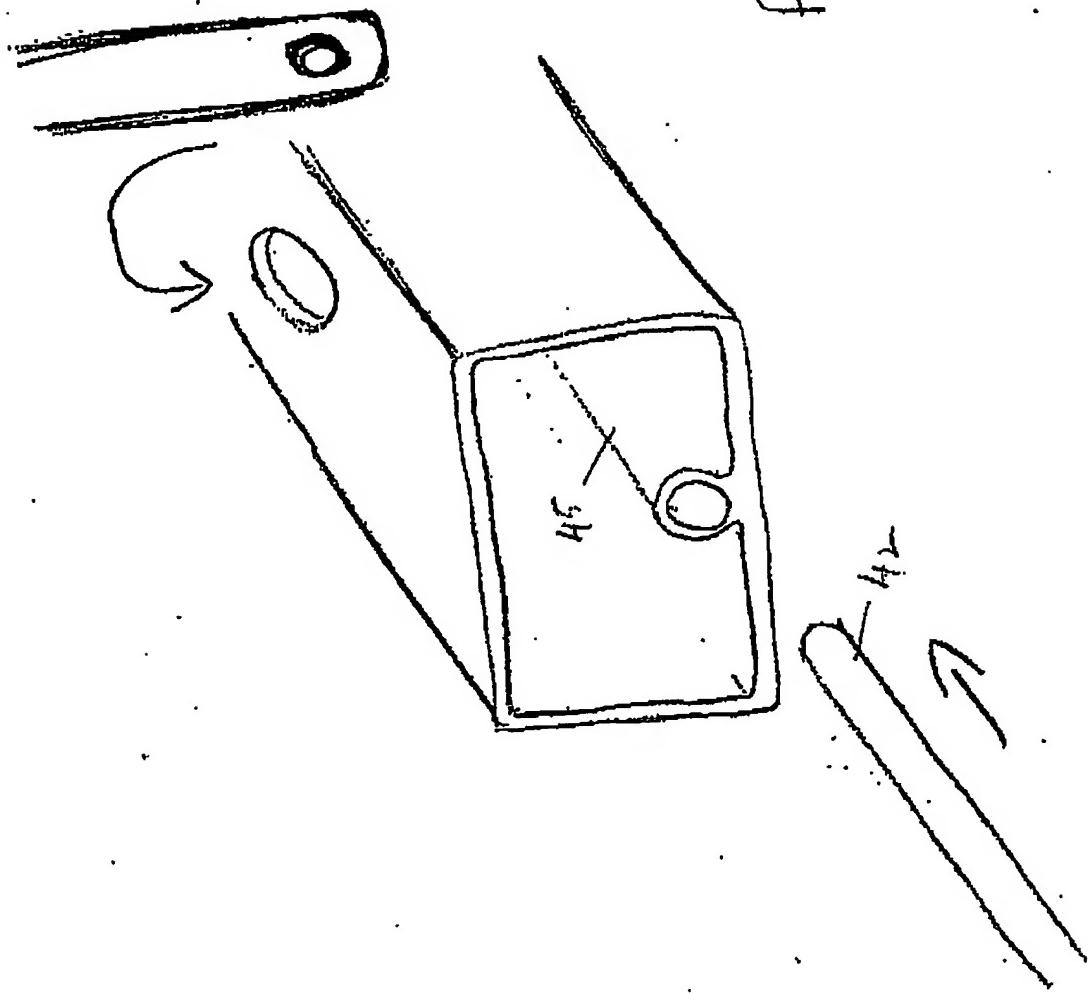
figure 4a

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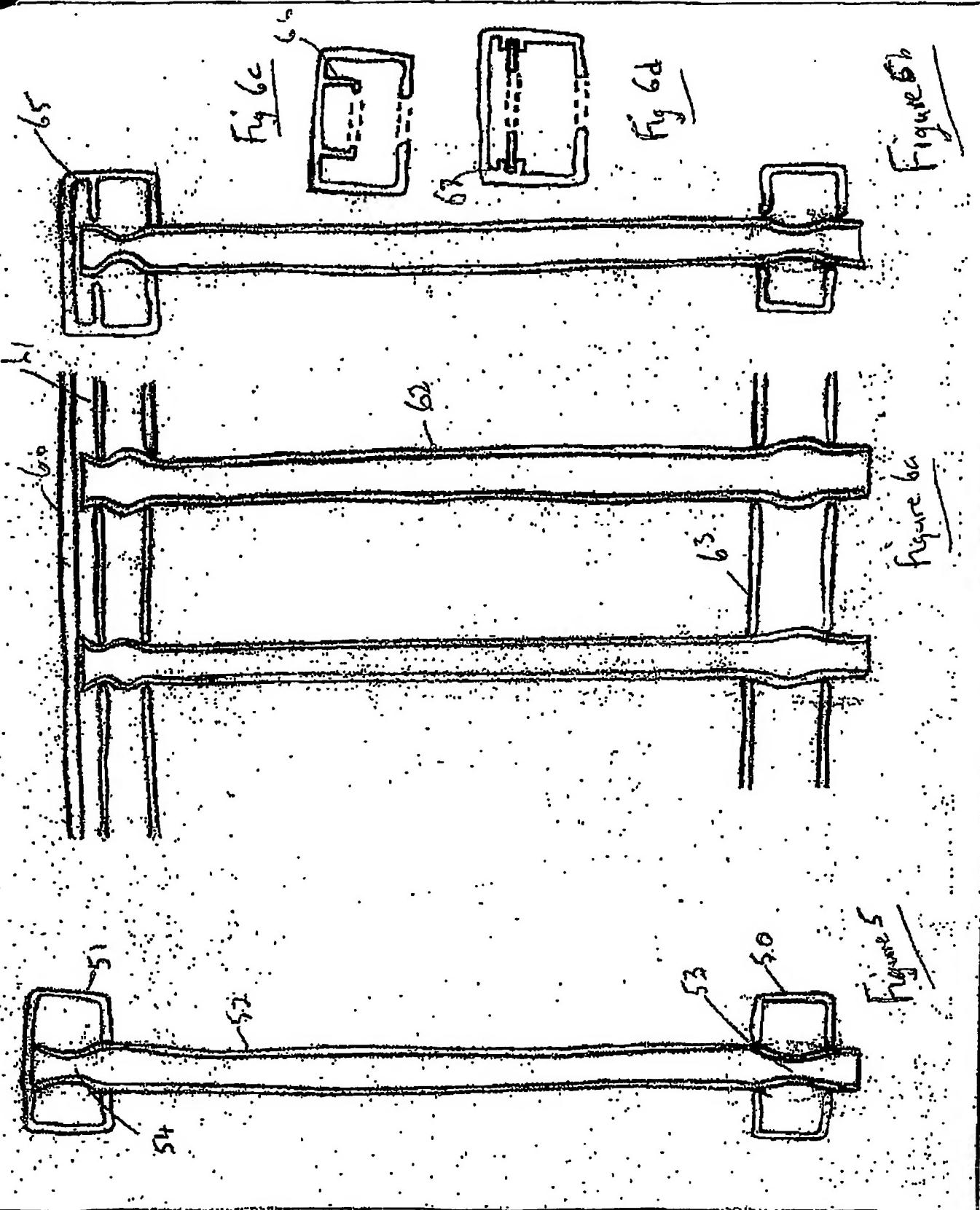
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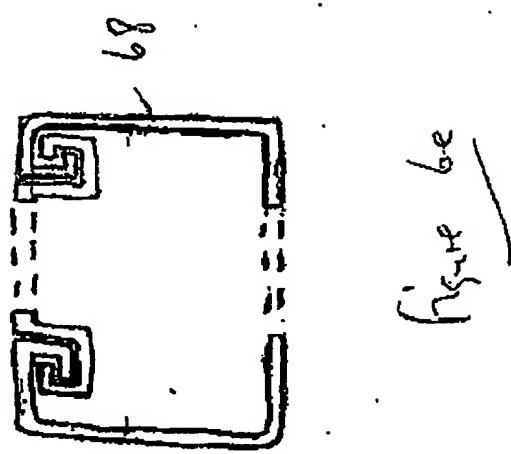


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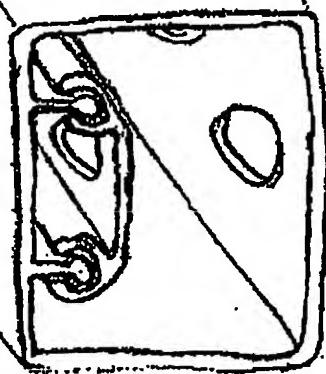


figure 7d

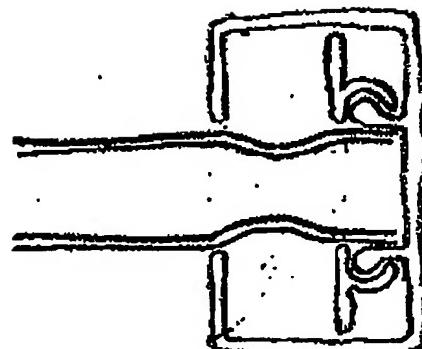


figure 7e

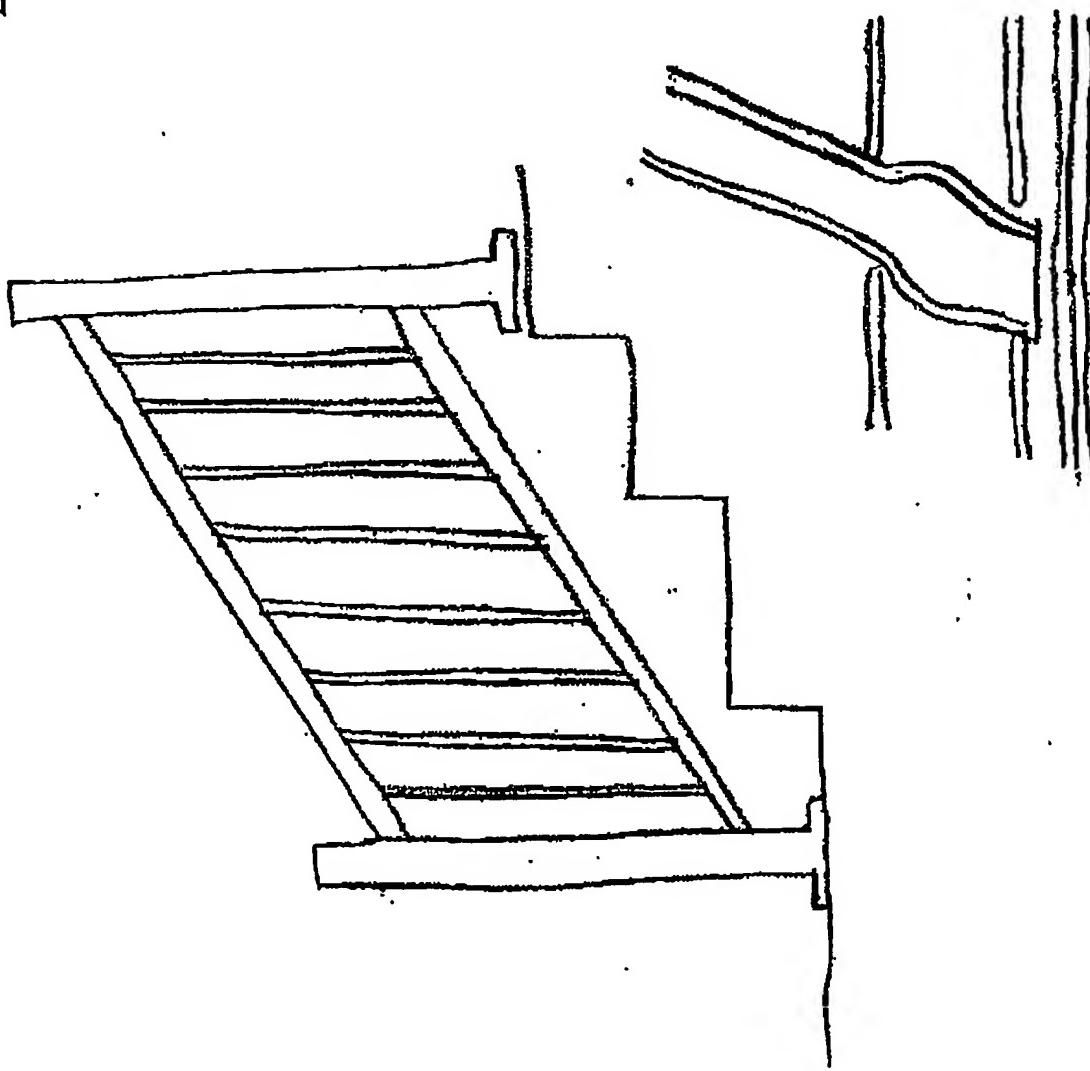


figure 7f

figure 7g

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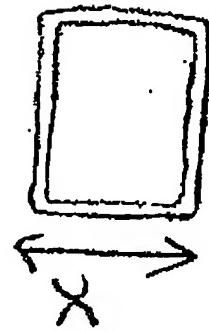
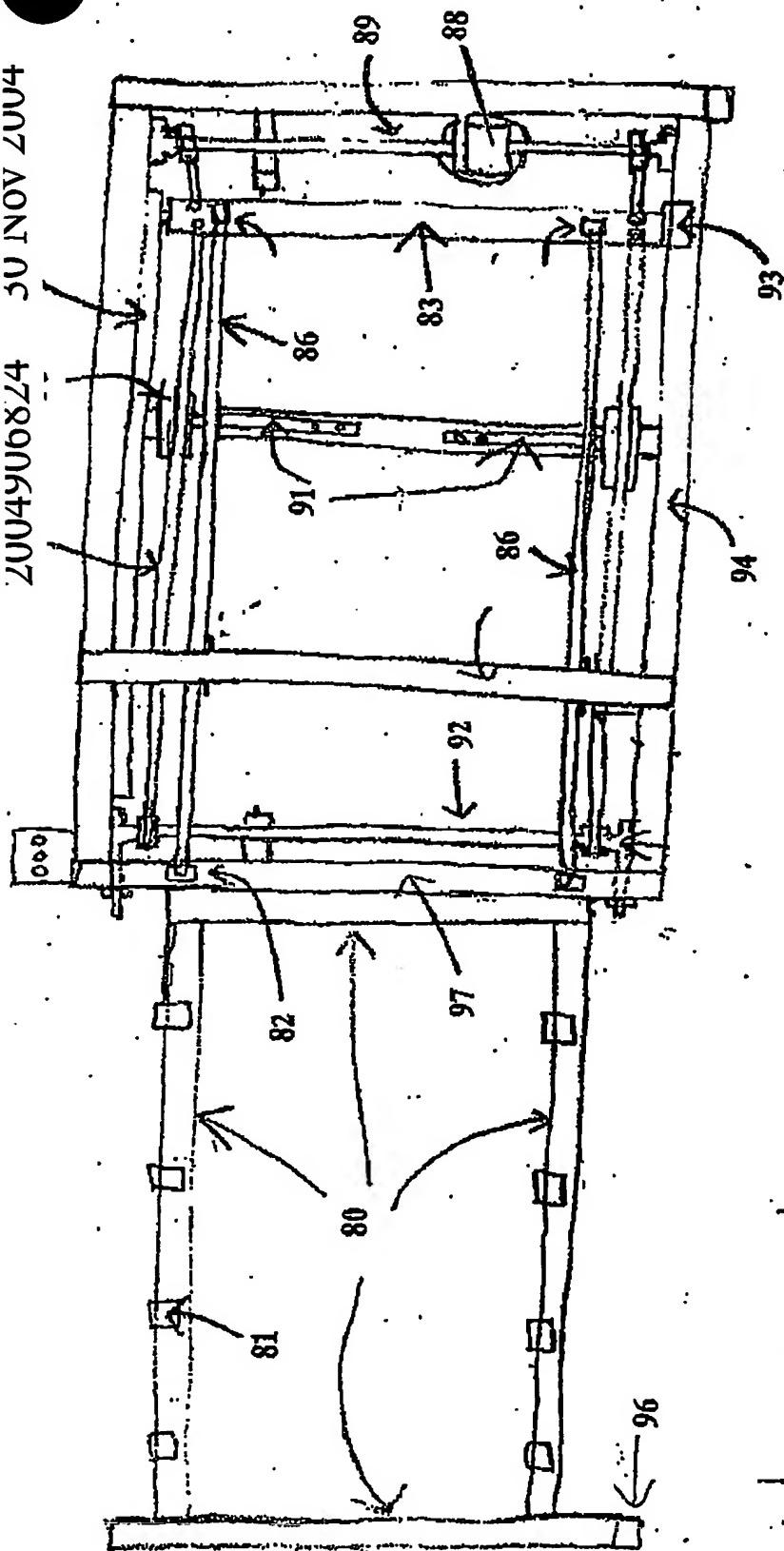
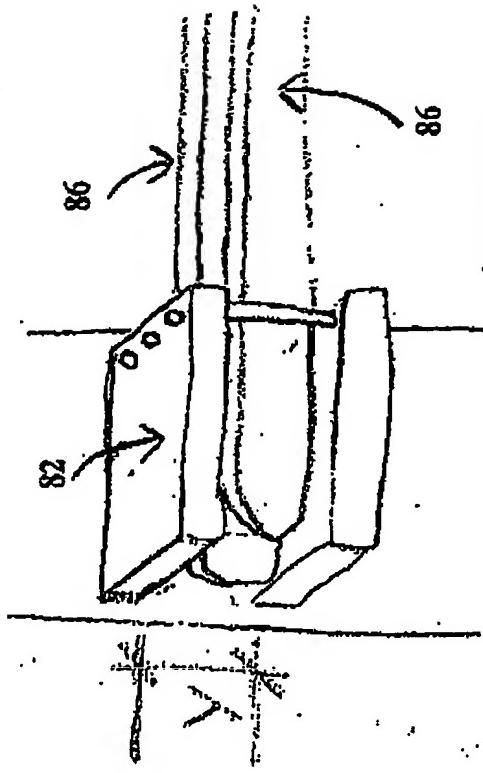
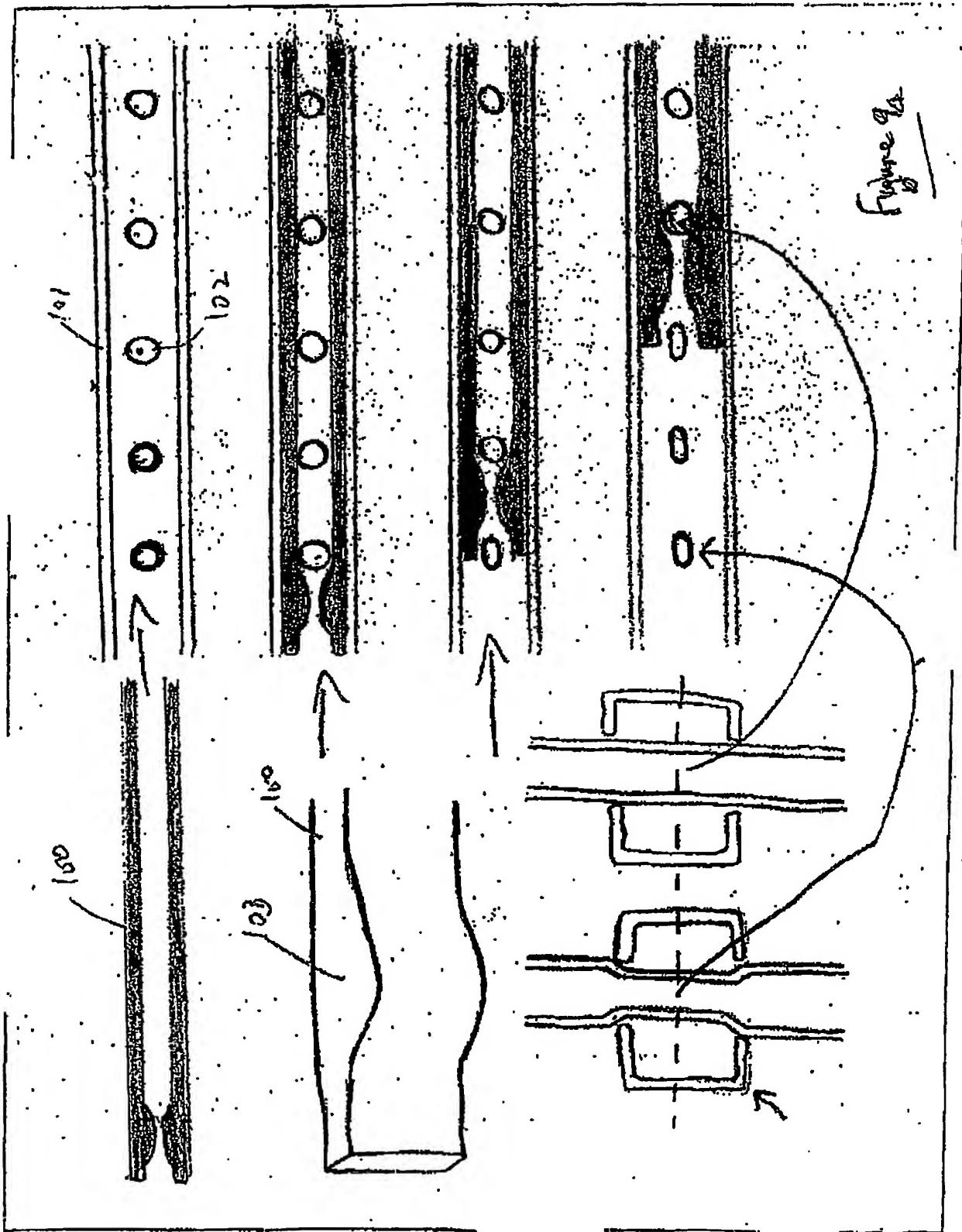


FIGURE 8B

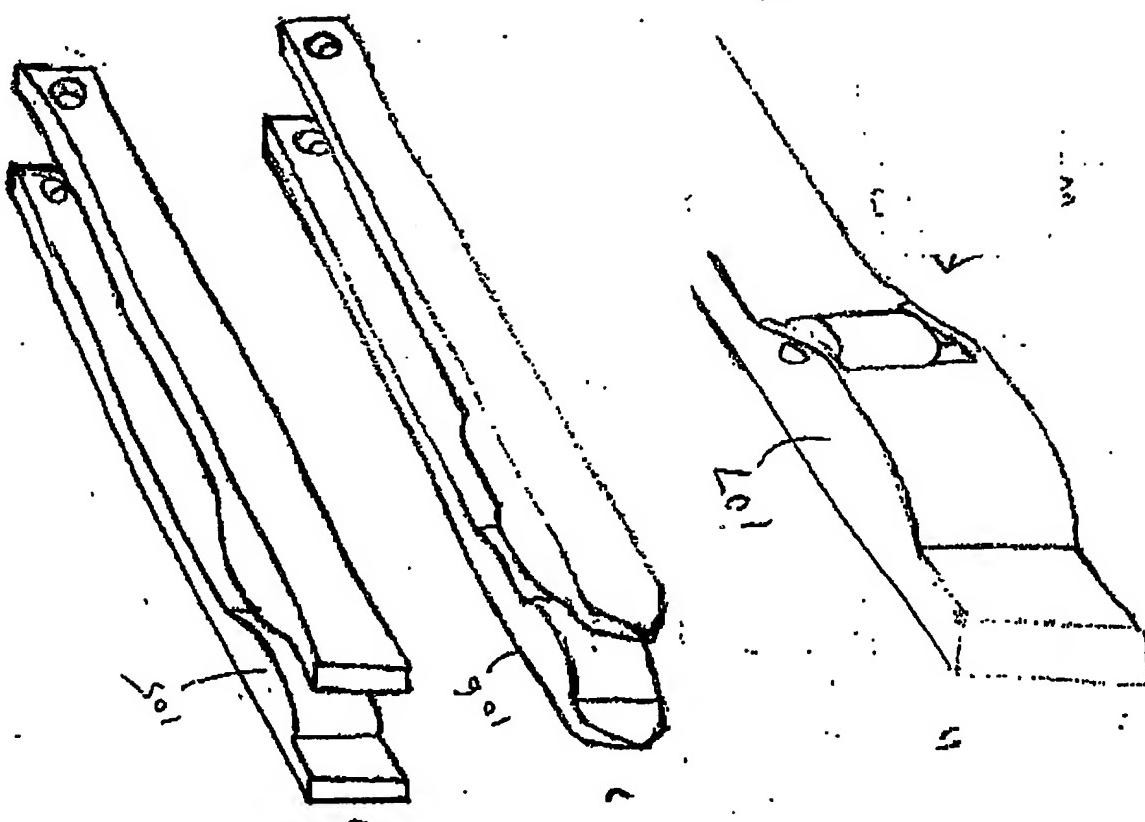


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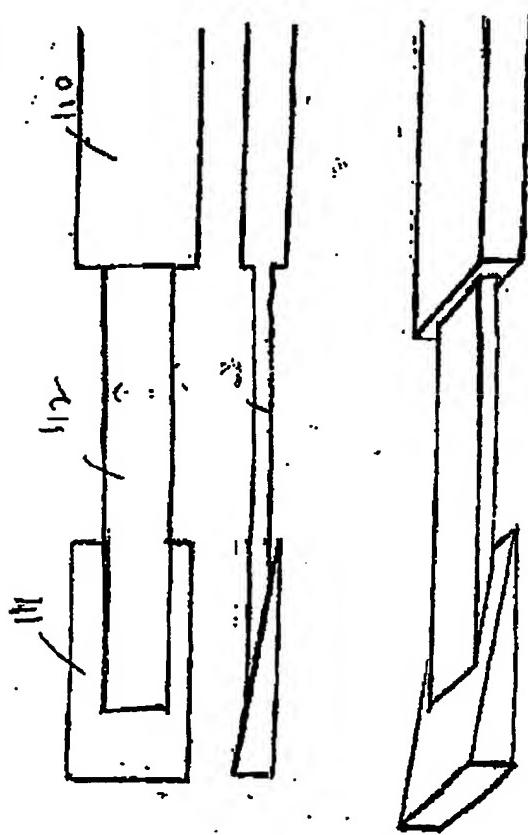
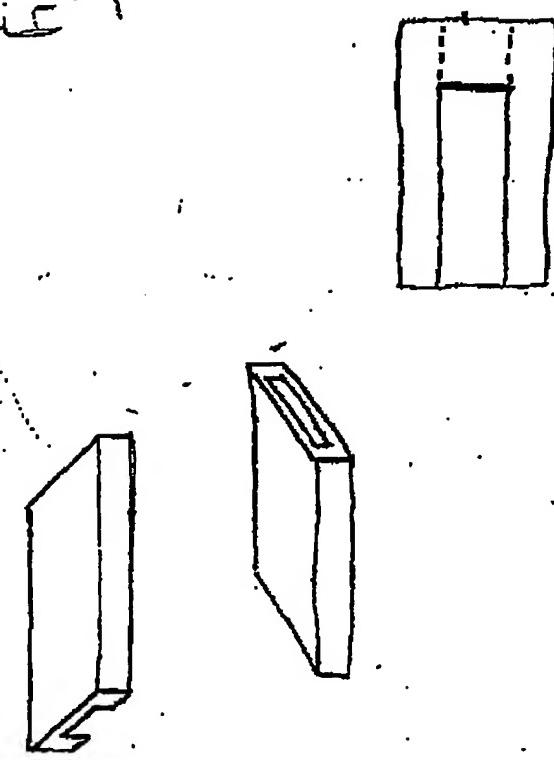


Figure 10a

Figure 10b



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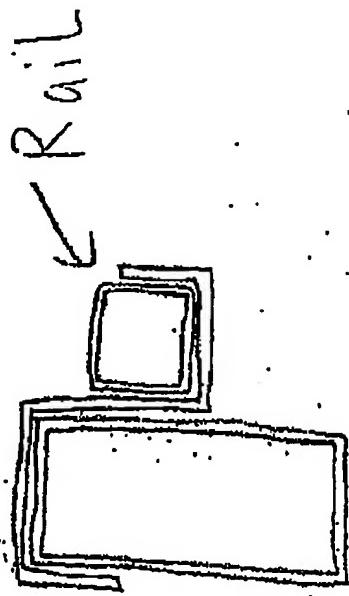
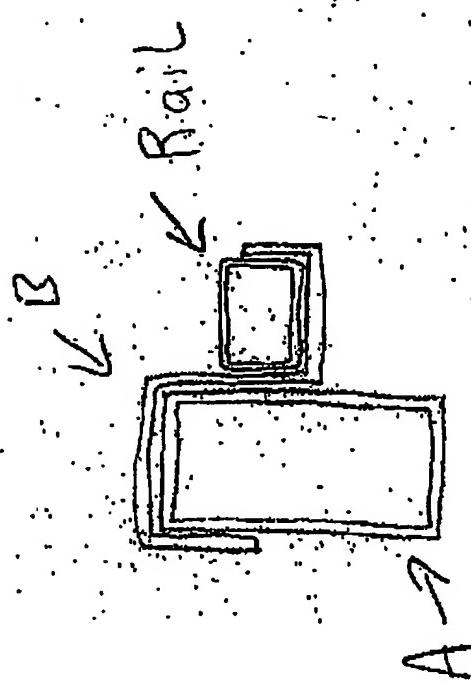
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Step ①

Rails are placed
on holders B.

Top rail and
Lower rail.

Figure 11a



Step ② (f: moved left)

Carrier T moves DRAW-bars / crimping Device T Left Fully into both Rails.

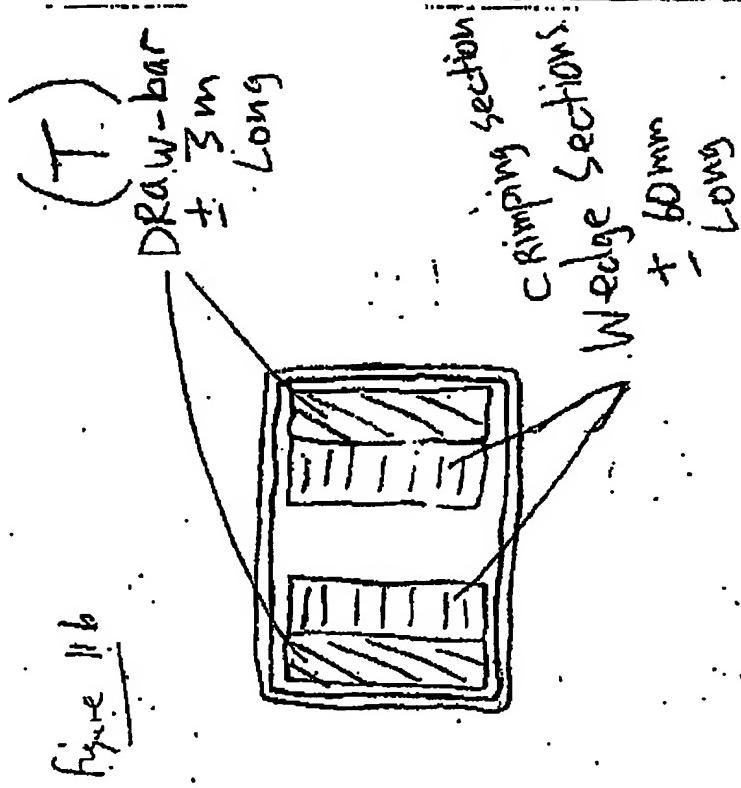
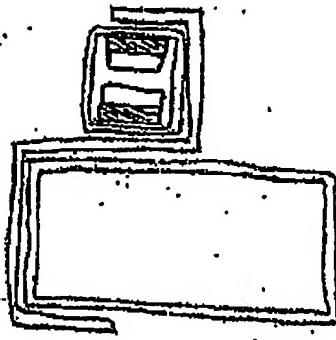
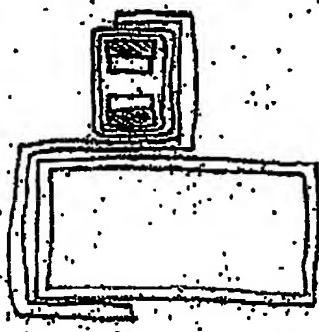
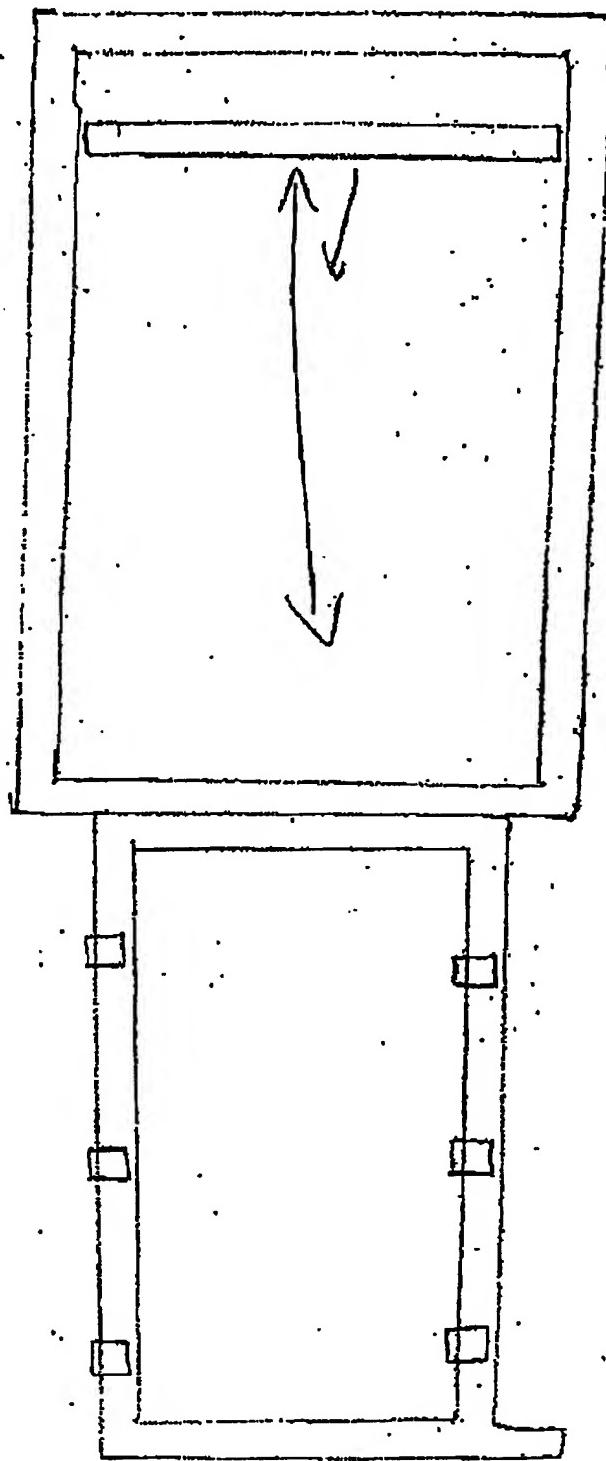


Figure 11 b



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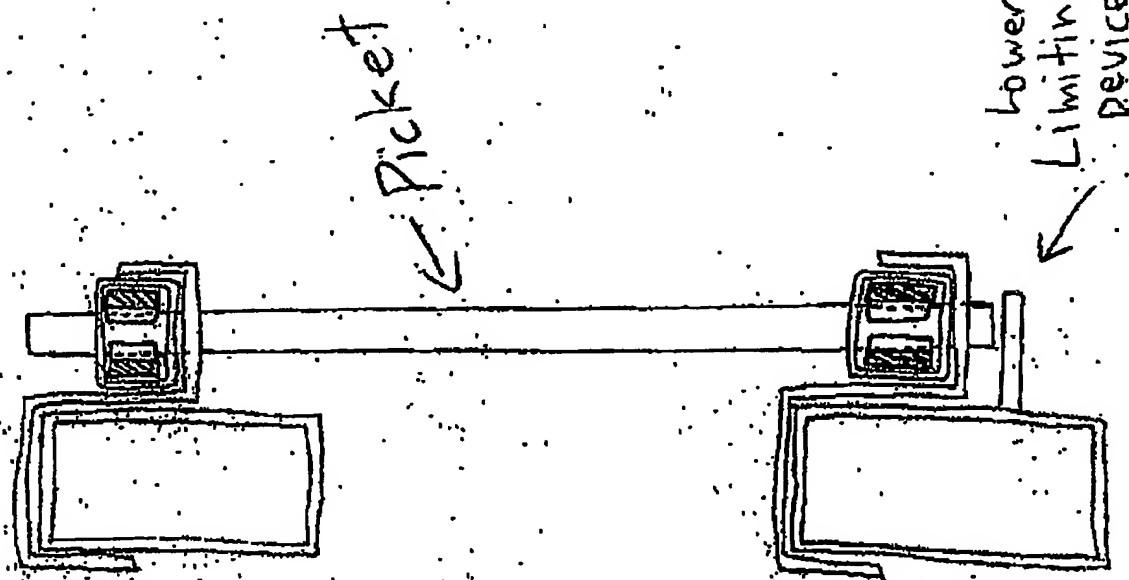


D Raw Bar Carriers can be moved left & right, inserting and retrieving Crimping Device by means of chain Drives, belt Drives, Cable Drives, Pneumatic Means, Hydraulic Means, screw thread or to any other kind of Linear Drive.

Figure 11.c

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Step 3
Pickets are inserted
along Rail into Pre-
Punched holes.

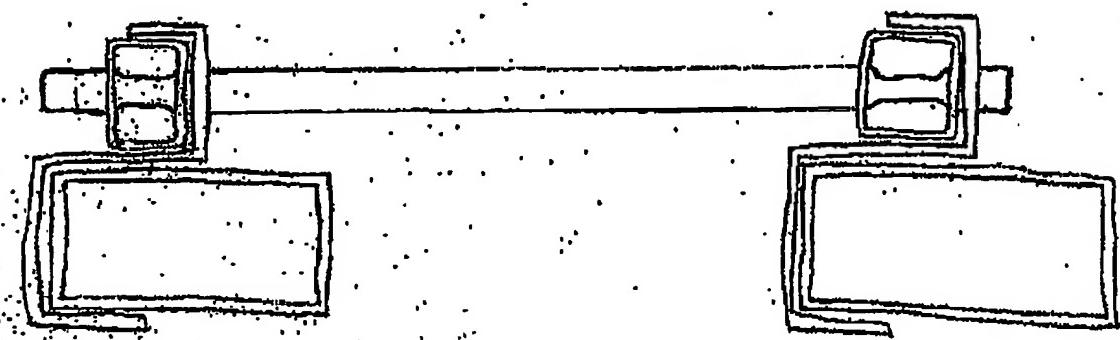


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Step 4

Device T is drawn
back out of Rail.

Wedge Sections of
Each Crimping Device
De Form each
Picket on passing

figure 11e

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